The Dominant Factors of Occupational Accident Risk Potential in Jember Regency

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Abstract

The construction industry sectors have a significant risk of work accidents, making it one of the industries with a relatively high level of risk. According to the ILO, in 2018, 2,78 million workers died each year due to work accidents (13,7%) and diseases due to occupation (86,3%). This study aims to analyze the risk of work accidents among informal housing construction workers in Jember Regency. This type of research is quantitative descriptive research. The research was conducted in housing that is under construction which is located in Sumbersari District, Patrang District, and Kaliwates District, Jember Regency. The population in this study involved informal construction workers in Jember Regency. The population in this study included an unlimited population because easily entered by anyone and as the characteristics of informal construction do not require special skills. The sampling technique used non-probability sampling techniques, the sample calculation used quota sampling. The number of samples used was 97 respondents. The Accidental Sampling technique was used to select the samples. Risk analysis was through the Delphi method. Based on the calculation of all the risks that exist, it is indicated that there are three hazard risks with priority status, which means that they require immediate treatment. The risk identified was the risk of falling at the roof work stage (CPE 211,22), the risk of electric shock during the electrical installation work stage (CPE 197,85), and the use of PPE during the roof work stage (CPE 184,75). There needs to be risk control concerning the hierarchy of hazard control.

Keyword:* *Construction, informal, work accident

INTRODUCTION

According to the International Labor Organization (ILO), in the world exists 2,78 million workers die each year due to work accidents (13,7%) and work-related diseases (86,3%) (ILO, 2018). The Director General of Occupational Health and Safety at the Ministry of Manpower stated that work accidents had increased yearly. Almost 32% of work accident cases in Indonesia occur in the informal sector (Kementerian Ketenagakerjaan, 2021). The construction industry is one of the industrial sectors with a relatively high risk of work accidents (Lokajaya, 2018). This is associated with the unique characteristics of construction projects, different work locations exposed to weather conditions, limited implementation time, dynamic and nature demanding high physical endurance, and the employment of significant untrained labourers (Elisa, 2017; Octavian, 2022; Riyadi, 2021).

According to Khosravi (2014), the construction industry ranks first as the most dangerous occupation in the world, with a five times higher risk of fatal work accidents and a 2,5 times higher risk of major injury than the manufacturing sector because the level of employee negligence is higher in this field. Important factors that have led the industry as a health, safety, environment (HSE) high-risk industry in the world can be cited such as

continuous changes in construction projects, using a lot of resources, poor working conditions, non-continuous employment, cross-seasonal work, and harsh environment (Soltanzadeh et al., 2019). Construction sector workers in Indonesia are broadly divided into formal construction workers, which means working for construction companies with legal entities, and informal construction workers, which work arises based on limitations in the formal sector in absorbing labour. Informal work is generally only based on orders and wages. The existing relationship is limited to employers and workers (labour), with minimal occupational health and safety (OHS) protection (Erniati et al., 2021; Fardiansyah, 2022).

Based on the preliminary study in September 2021 in Jember Regency, most of the population uses the informal services of construction workers for building houses or other physical buildings. The informal construction workers are dominantly daily wage or contract workers who do not have a formal work bond with a company (lacking formal guarantees for their health and safety) (Idris et al., 2015). Out of the 20 respondents in five housing projects, all workers had experienced work accidents, including being stabbed (40%), falling material (25%), falling from a height (20%), being crushed by material (10%) and hammered (5%).

This condition does not align with the regulations of the Republic of Indonesia Law Number 1 of 1970 concerning Occupational Safety Article 3 paragraph (1) stipulates safety requirements to prevent and reduce accidents (Kurniawan, 2022). Based on the previous results and discrepancies between working conditions in the field and regulations related to the fulfillment safety requirements, especially related to the fulfillment of personal protective equipment, it is necessary to carry out further studies regarding the dominant factors of the potential risk of work accidents in informal housing construction workers in Jember Regency. This study aims to analyze the most dominant risk of work accidents among informal housing construction workers in Jember Regency.

METHODS

This type of research is quantitative descriptive research. Furthermore, an assessment of each of these variables was carried out using analytical techniques. The research design used in this research employed a cross-sectional approach. This study aims to explain the value of the risk contained in the work process by describing the process of analyzing work safety using a semi-quantitative method to determine the Consequences, Probability, and Exposure levels of each existing risk, risk direction, and control.

The research was conducted in housing that is under construction which is located in Sumbersari District, Patrang District, and Kaliwates District, Jember Regency. These sub-

districts were selected because they have the most realized housing, so many workers are concentrated in these three sub-districts. This research was conducted from February to March 2022. The population in this study involved informal construction workers in Jember Regency. The population in this study included an unlimited population because the informal construction sector is easily entered by anyone and as the characteristics of informal construction do not require special skills. Therefore, the sampling technique used non-probability sampling techniques. The research sample was 97 people using an accidental sampling technique.

The variables in this study are the characteristics of informal construction workers, hazard identification, risk assessment CPE (consequences is the impact of an accident, probability is the likelihood of an accident occurring, exposure is the frequency of an accident), risk control, and determining the dominant factor from the CPE priority results. Risk analysis was through the Delphi method, in which three experts discussed this CPE's results to determine the most dominant risk factor in this informal construction sector. The calculation of CPE in this study using the risk assessment criteria of AS/NZS 4360. After assigning CPE values to each identified risk, the CPE values are multiplied to obtain the magnitude of the risk value. The categories of risk value can be seen in Table 1 below:

Table 1. Category of Risk Assessment Results

Category	Grade
Very High	>350
Priority	180-350
Substantial	70-179
Priority 3	20-69
Acceptable	<20

RESULTS

This type of research is quantitative descriptive research. Based on the results of data collection in the field, it is known that informal housing construction work in Jember Regency has several stages, including preparatory Stages, excavation Work, installation of Frames and Door/Windows Work, plastering Work, roofing Work, ceiling Work, painting Work, floor Installation Work, construction of Sanitation and Clean Water, electrical Installation Work and cleaning.

In these stages, there are several types of hazards, namely kinetic, mechanical, electrical, chemical, and behavioral hazards. The distribution of individual respondents' characteristics, including age, gender, and highest education level, is presented in the following table:

Table 2. Description of Respondents Individual Characteristics

Variable	n	%
Age		
19-24 years	6	6,19
25-29 years	17	17,53
30-34 years	17	17,53
35-39 years	22	22,68
40-44 years	21	21,65
45-49 years	12	12,37
50-54 years	2	2,06
Gender		
Woman	0	0
Man	97	100,00
Last Education		
No school	19	19,59
Elementary School	29	29,90
Junior High School	32	32,99
Senior High School	17	17,53
College	0	0

Based on Table 2, it can be seen that the youngest respondent's age is 19 years old, while the oldest is 54 years old. The most age distribution of respondents is the age range of 35-39 years old (22,68%), while the least is the age range of 50-54 years (2,06%). All respondents in this study are men. Regarding the highest educational category level, the highest number of respondents with junior high school education (32,99%).

The descriptions of the respondents' work characteristics distribution ranging from years of service, job risks, to the use of PPE to minimize risk are presented in the following table:

Table 3. Description of the Respondents' Work Characteristics

Variable	n	%
Years of Work Experience		
New (< 6 Years)	33	34.02
Moderate (6-10 Years)	63	64.95
Old (> 10 Years)	1	1.03
Work-Related Hazard Risks from Work to Home		
Yes	97	100.00
Slipped	28	
Fell	19	
Bumped	35	
Electrical Shock	15	
No	0	0
Have had a work accident		
Yes	97	100,00
Pierced	20	
Slipped	42	
Fell	28	
Electrical Shock	7	
No	0	0

Table 3 shows that most of the respondents (64,95%) have moderate working years (6-10 years). All respondents stated there was a danger when working until they go home. These hazards include slips, falls, collisions, and electric shock. All respondents also had experienced work accidents. The most common accidents are slips, falls, pierces, and electric shocks.

Table 4. Description of the respondent's work accident experience

Variable	n	%
Have Experienced Poisoning While Working in the Past Three Months		
Yes	0	0
No	97	100,00
Have Experienced Health Problems while Working		
Yes	64	65,98
Dizzyness	22	
Sprains	18	
Back Pain	24	
No	33	34,02
Experienced Stress in the Last Three Months		
Yes	41	42,27
Monthly bill	31	
Boss scolded	10	
No	56	57,73
Comfortable with Work Environment		
Yes	0	0
No	97	100,00
Noisy	26	
Hot	71	
Using PPE		
Yes	21	21,65
Shoe	11	
Gloves	10	
No	76	78,35
Uncomfortable	76	

Table 4 show that all respondents felt that they had never been poisoned at work. Most of the respondents (65,98%) stated that they had health problems at work, namely dizziness, sprains, and back pain. As many as 42,27% of respondents experienced stress in the last three months caused by monthly bills and scolded boss. All respondents felt the work environment was uncomfortable because it was hot and noisy. However, only 21,65% of respondents used PPE, such as shoes and gloves, the rest did not use PPE for reasons of discomfort.

Hazard Priority in Housing Informal Construction Work in Jember Regency

Hazards that have been identified and assessed from each stage of work are then sorted from the highest value/hazard that must be prioritized to be addressed first. The following are the 10 hazards with the highest risk values in housing construction work in Jember Regency, as follows:

Table 5. Hazard Priority in Housing Informal Construction Work in Jember Regency

No	Stages	Risk Factors	C	P	E	Grade	Risk Criteria
1	Roofing Work	Fell	5,07	7,06	5,90	211,22	Priority
2	Electrical Installation Work	Got Electric Shock	5,91	6,48	5,16	197,85	Priority
3	Roofing Work	PPE Use	5,02	6,16	5,97	184,75	Priority
4	Ceiling work	Fell	5,09	6,16	3,99	125,26	Substantial
5	Electrical Installation Work	PPE Use	3,92	4,89	5,00	95,72	Substantial
6	Excavation Work	Lifting/Transportation	2,96	5,02	6,01	89,28	Substantial
7	Electrical Installation Work	Irregularly Moving Objects	2,06	6,00	7,06	87,262	Substantial
8	Floor Installation	Grinding Use	4,07	5,06	4,07	83,94	Substantial
9	Excavation Work	Pinched	2,96	4,88	5,03	72,56	Substantial

Table 5 shows that the risk of falling at the roofing work stage has the highest risk value of 211,22 with priority status. The next highest score is electric shock during electrical installation work, which is 197,85 with priority status. The third highest score is the use of PPE in roofing work with a value of 184,75 with priority status.

DISCUSSION

Respondents' Activities and Characteristics of Informal Housing Construction Workers in Jember Regency

The construction workers identified in the study were all male, with the youngest workers being 19 and the oldest being 54. The most common age range is 35-45 years, the average level is junior high school education, and the average work experience of workers is 6-10 years. The workers frequently encountered the risk of bumping while doing their job. They admitted to having experienced work accidents, specifically slipping. None of the workers' experience poisoning while working. Back pain is a common complaint among the workers during their work. The majority of them experience work stress, mainly due to monthly bills. These complaints are also added to the hot work environment. In addition, workers also need to pay more attention to safety because the majority of them do not use PPE. Based on the results of observations, the workers feel uncomfortable when using PPE during their work. This is in line with research which states that there are always significant challenges in improving the safety culture by changing and adding additional safety protocols (Briggs et al., 2022).

Hazard Priority in Housing Informal Construction Work in Jember District

Based on the calculation results of all the risks involved in the housing construction process, it is known that there are three hazard risks with priority status, which means they require immediate attention or handling. These risks include the risk of falling during the

roofing work, the risk of electric shock during the electrical installation stage, and the use of PPE during the roofing work. This is in line with research which states that evidence can be found increase of fatal accidents. In particular occupational diseases became a health concern in construction (Marchello, 2018).

The roofing work process has a very at risk of falling due to working at heights. In order to minimize the risk of workers falling from heights while working, the following things can be done, as follows (Arman et al., 2021) : 1) look for other alternatives besides working at height, 2) Make plans related to hazards, such as: Prepare the necessary PPE, Using a safety net, Pay attention to whether there are power lines around the work area, Pay attention to the maximum load that can be supported by the structure where workers work, Be careful with a possibility of falling objects, Preparing to scaffold, Pay attention to any holes or weak footholds—Mark dangerous areas or locations, Try to avoid working on ladders. 3) Do the work according to plan and use fall protection. There are 2 types of falls protection: a) Collective fall protection is a device that prevents workers from falling, such as fences/guardrails, work platforms, scaffolds, etc. and additional equipment, such as safety nets, air bags or crashes decking, b) Individual fall protection is a device that protects workers in case of a fall, such as fall arrest system. It may involve using a full-body harnesses and lines.

Stop work if necessary, In electrical installation work, the risk of electric shock is very high. Besides being directly related to the flow of electricity, electrical cables that are not neatly arranged are also one of the causes of electric shock (Kurniawan, 2022; Septianto, 2020). According to Agus (2017), cables that need to be neatly arranged can increase the risk of tripping. If a worker trips over a cable and the cable breaks, it can result in an electric shock. The cause of tripping on the workshop section is tangled wires and materials laying on the floor. According to Oliver *et al.* (2019), changing the design of the workplace can reduce the risk of tripping or slipping. In addition, it is necessary to use appropriate PPE in order to minimize the risk of electric shock.

The third hazard risk with priority status (requiring immediate treatment) is the use of PPE (Afolabi et al., 2021; Dore et al., 2022; Manurung, 2020). The use of PPE is one method of controlling hazards (Rohmatillah et al., 2021; Yuniastuti et al., 2021). Even though PPE is considered as the last line of defence in the hierarchy of hazard controls, neglecting it can increase the risk of work-related accidents (Agus, 2017; Marchello, 2018). Using PPE correctly can also minimise the two hazard risks discussed earlier. According to the ILO, there are more than 250 million accidents in the workplace every year. This is in line with research which

states that cause of accidents as much as 80% is due to negligence committed by workers, namely unsafe behavior, such as not wearing PPE (Afolabi et al., 2021; Widyawati, 2021). In order to anticipate this issue, companies that provide housing construction workers should have a policy that requires their workers to use PPE. Other research results show that besides having a policy on the use of PPE, companies are also required to provide and manage PPE for workers, monitor compliance with PPE usage, and socialize the importance of PPE in a job This is consistent with research states that the factors that influence OHS on OHS in construction projects are strong at 0.614, the coefficient of determination is 0.377 indicating an average OHS value in construction projects of 37.7% is determined by 3 factors that affect OHS, while 62.3% is determined by other factors (Ningsih, 2020).

CONCLUSIONS

Based on the results of observations, workers feel uncomfortable using PPE while working. After conducting a risk assessment at each stage of the work, three hazards with the highest risk values are obtained: the risk of falling during the roofing stage, the risk of electric shock during the electrical installation stage, and the use of PPE during the roofing stage. These three hazards have a Priority risk level, which means they require immediate treatment. Therefore, it is necessary to control the hazard by concerning the risk control hierarchy. Preferably workers to do the control measures for the three dominant factors can be easily implemented by designing suitable and strong scaffolding, ensuring the use of PPE, and ensuring no electric current during the work. Future research is expected to conduct research with a wider range of data.

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